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Abstract

THE UTILIZATION OF THE 2MW RESEARCH REACTOR OF THE UARAEE (UA-RR-1) FOR PHYSICS RESEARCH AND ISOTOPE IRRADIATION

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The UA-RR-1 is a pool type reactor which was purchased in the USSR on the basis of a bilateral agreement. It was made critical in July 1961, and attained its nominal power of 2MW during the following September. The purpose of installing the reactor is to conduct research in the fields of physics, chemistry and biology, to produce radioisotopes and to provide training in reactor engineering. This paper will deal with the operating conditions and co-ordination of the different uses of the reactor as well as the development of the physics research programme utilizing this reactor.

During the construction and assembly period of the reactor, the few technical and scientific staff available took an active part in the various problems associated with this period. Very little effort was left for planning and preparing for the utilization phase. Such a situation is perhaps characteristic of many countries developing their traditions in nuclear sciences.

The programme of physics research was planned taking into consideration the many facilities for research offered by the reactor, namely nine horizontal channels, one thermal column and several irradiation channels. Also, it was felt that from the point of view of reactor exploitation economy, it would be better if the reactor were utilized for several purposes of several experiments at the same time. During the last two years the number of physics research workers utlizing the reactor has reached about forty people doing ten experiments. These experiments include: thermal and epithermal neutron flux determination, fast neutron flux and spectrum measurement using activation detectors, angular correlation of prompt gamma rays and direction

of flight of fission fragments, measurement of inelastic scattering cross-section and angular distribution of scattered fission neutrons, studies of neutron capture gamma rays, measurement of thermal neutron spectra and cross-sections using a mechanical chopper, neutron diffraction studies, radiation effects on glass, radiation effects on the order-disorder transformation in alloys.

In developing this programme we invited specialists from different research institutions. Some foreign specialists were invited either through the IAEA or through bilateral agreements. A number of 15 junior scientists are sent abroad for training, either through IAEA fellowships or through scholarships.

After the erection of a radioisotope production laboratory in the vicinity, full use is made of the available irradiation facilities. The irradiation channels were divided into three groups depending on the half-lives of the produced isotopes. Several facilities have been developed to facilitate dealing with the different problems of the isotope irradiation process such as: loading and unloading of samples, transportation of irradiated samples, irradiation of long-lived isotopes and disposing of solid waste. The reactor is now being operated for one shift per day, five days a week. Each couple of weeks, the reactor is operated for a continuous run of 48 hours at full power.

For the production of long-lived isotopes such as Co^{60} and Ir^{192} under the adopted operational schedule, calculations showed that the produced activity can be estimated by assuming that the reactor is working continuously at 30% of its full power.

A firm organization is adopted to guarantee the safety of personnel and the safe operation of the reactor. Since the reactor reached criticality in July 1961, it has operated for about 4000 MWh, without any accident. There has been no long "out of operation" periods caused by major repairs or adjustments.